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FEDERAL COMMUNICATIONS COMMISSION  
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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

In re:

Redevelopment of Spectrum to  
Encourage Innovation in the  
Use of New Telecommunications  
Technologies

ET Docket No. 92-9

RM-7981

RM-8004

Comments of Hughes Communications Galaxy, Inc.

Hughes Communications Galaxy, Inc. ("HCG") hereby comments on the Commission's Further Notice of Proposed Rulemaking, released September 4, 1992, in this proceeding ("NPRM"). In the NPRM, the Commission has proposed to (i) reallocate the 4 GHz band to allow displaced 2 GHz microwave systems to operate there on a co-primary basis, and (ii) rechannelize the 4 GHz band from its current 20 MHz channels into many smaller channels that range from 400 kHz to 10 MHz.

I. Introduction.

HCG and its affiliates operate the largest fleet of domestic communications satellites. Six of HCG's nine in-orbit domestic satellites contain C band capacity that operates in the 4 GHz frequency band the Commission proposes to reallocate and rechannelize. HCG and its customers provide many essential services over HCG's C band satellite capacity, such as commercial television and radio distribution, teleconferencing, video backhaul, high speed medical image transmission and private data

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networks. Countless end users across the country rely on these services every day.

HCG is concerned about certain aspects of the NPRM that would affect satellite operations in the 4 GHz band, which is used for satellite downlinking (space to earth transmissions). In particular, the proposed rechannelization of the 4 GHz band would unduly disrupt many existing satellite services.

At the outset, HCG emphasizes that it supports the Commission's proposal to allocate 220 MHz of spectrum to emerging telecommunications technologies. To this end, HCG does not object to sharing the 4 GHz band on a co-primary basis with the microwave users who will be displaced from the 2 GHz band. However, such sharing should be accomplished in a manner that is harmonious with existing use of the 4 GHz band by countless providers and recipients of satellite services.

## II. The Proposed Rechannelization Plan Would Increase Interference.

HCG previously has expressed concern that rechannelizing the 4 GHz band would unduly disrupt the coordination procedures that have allowed satellite users and terrestrial microwave users to co-exist for the last two decades, and would lead to increased interference into earth stations.<sup>1</sup> Almost all C band users would be affected by the proposed 4 GHz

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<sup>1</sup>/ See HCG's Reply to Alcatel Network Systems, Inc.'s Petition for Rulemaking, RM-8004, filed July 17, 1992.

band rechannelization, including cable headends and television and radio receive-only ("TVRO") dish owners.

Over the past two decades, the satellite industry has burgeoned as users have poured billions of dollars into satellites and transmission and reception equipment, all in reliance on the existing regulatory scheme at C band. In adopting the rechannelization proposal, the Commission stated that it would not "impose undue hardships on the existing users of the bands above 3 GHz" in meeting the needs of displaced 2 GHz users. NPRM at ¶ 17. The NPRM, however, simply fails to address the serious concerns about interference into C band satellite operations that were expressed by HCG and other satellite operators (such as GTE Service Corporation and GE American Communications, Inc.) in response to the Alcatel Network Systems, Inc. Petition for Rulemaking in this matter

Satellite services already share the 4 GHz band on a co-primary basis with certain terrestrial microwave services. Even though terrestrial use of this spectrum is heavy, existing channelization and coordination methods are a relatively effective means of allowing these two competing uses of the spectrum to co-exist without undue interference.

The primary reason for the peaceful co-existence of both terrestrial and satellite use of the 4 GHz band is that the 4 GHz band is broken down into 20 MHz "wideband" channels. In order to optimize the use of available spectrum, while also minimizing the risk of interference, C band satellite transponders are designed so their center frequencies are located

in the middle of the terrestrial 20 MHz channels.<sup>2</sup> Coordination of terrestrial channels and satellite channels is accomplished by interweaving the channels in such a way that their center frequencies (where most of the energy is centered in an analog signal) are spaced as far apart as possible, by  $\pm 10$  MHz. See Exhibit 1. This allows satellite receivers to screen out the edges of the transponder where terrestrial interference may be present.

Consider a satellite transponder that operates in the 3700-3740 MHz range. Most of the energy transmitted to carry a video signal is concentrated in a 15 MHz (or smaller) band at the center of the 40 MHz transponder. Earth stations in congested urban markets (such as TVROs) often are able to co-exist with microwave facilities through a combination of using filters and employing other interference reducing means. By utilizing filters, an earth station often can cut off the upper and lower 12.5 MHz of the transponder's frequency band without adversely affecting the quality of the signal that it desires to receive.<sup>3</sup> See Exhibit 2. This effectively eliminates potential terrestrial interference because the unwanted terrestrial signals are centered in the portion of the frequency that the filters eliminate. Thus, little interference occurs in the "heart" of the video signal.

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<sup>2/</sup> Nominal 40 MHz transponders are the standard for C band satellite communications.

<sup>3/</sup> This method may not work with digital or HDTV video signals of the future because the digital signal will be spread throughout the entire transponder. Loss of a portion of the transponder may render the entire video signal unusable.

The Commission's proposal to rechannelize the 4 GHz band into smaller channels that range from 400 kHz to 10 MHz would make earth station coordination extremely more difficult, if not impossible. In particular, it will destroy the interleaving of frequencies that allows satellite and terrestrial users to share the same band successfully, even in frequency-congested urban areas.

A proposed 10 MHz channel, for example, would provide an offset of only 5 MHz from the center of a 40 MHz satellite channel. As a result, each satellite transponder could be flanked by a terrestrial channel whose center frequency is only 5 MHz away. Returning to the example above, if a video signal were carried on this transponder, terrestrial signals would be present in the very heart of the video signal. From the perspective of a TVRO user, the interference now might be insurmountable. While he previously could install a filter that suppresses the interfering terrestrial signals (when those signals were located outside the center of the video signal), filters that now would suppress the terrestrial channels would also suppress critical portions of the desired video signal. See Exhibit 3. Because the Commission has proposed breaking down the entire C band into channels 10 MHz, these problems exist across the entire 4 GHz spectrum now used for C band downlinks.

These problems are exacerbated when the spectrum is broken down into even smaller channels of 400 kHz to 5 MHz, as the Commission has proposed doing for the upper and lower 40 MHz of the C band (i.e., 3700-3740 MHz and 4160-4200 MHz). Those

spectrum blocks include channels that essentially would be co-frequency with the center frequencies used on four of the twenty-four transponders on a C band satellite.<sup>4</sup> No filtering could help: competing satellite and terrestrial uses would be incompatible in these circumstances.

The proposed channelization plan is particularly disruptive to single carrier per channel ("SCPC") services. These services, by definition, operate on small channels and at low power, and therefore are more interference sensitive than full-transponder FM TV signals. Moreover, many SCPC services have developed over the years on transponder frequencies that are at the lower edge of the C band, where the Commission proposes to locate half of the small terrestrial channels. In order to avoid terrestrial interference, many users of these services may be forced to expend considerable sums to change the frequencies that they have been using for years.

As set forth in the NPRM, the Commission has proposed to open other frequency bands to displaced microwave users, none of which, HCG believes, present the problems raised by the proposed channelization of the 4 GHz band discussed above.<sup>5</sup> HCG urges the Commission to consider whether the narrowband (less than 20 GHz) needs of microwave users can be met in frequency bands other than 4 GHz. To the extent this can be done, HCG

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<sup>4/</sup> For example, the NPRM calls for a 1.6 MHz channel at 3720.84 MHz, a 400 kHz channel at 3719.7825 MHz, and an 800 kHz channel at 3719.575 MHz. The center frequency of the first transponder on a C band satellite is 3720 MHz.

<sup>5</sup> E.g., 6 GHz, 10 GHz, 11 GHz.

urges the Commission accommodate those needs in such other frequency bands. Rechannelization of the 4 GHz band, and the resulting disruption to the satellite industry, should be effectuated only as a last resort.

### III. Conclusion.

The Commission's rechannelization proposal for the 4 GHz band poses a very real threat of disrupting satellite users. HCG urges the Commission to consider whether the needs of displaced microwave users can be met by allowing them to operate solely on 20 GHz channels in the 4 GHz band, and on smaller channels in other frequency bands.

Respectfully submitted,

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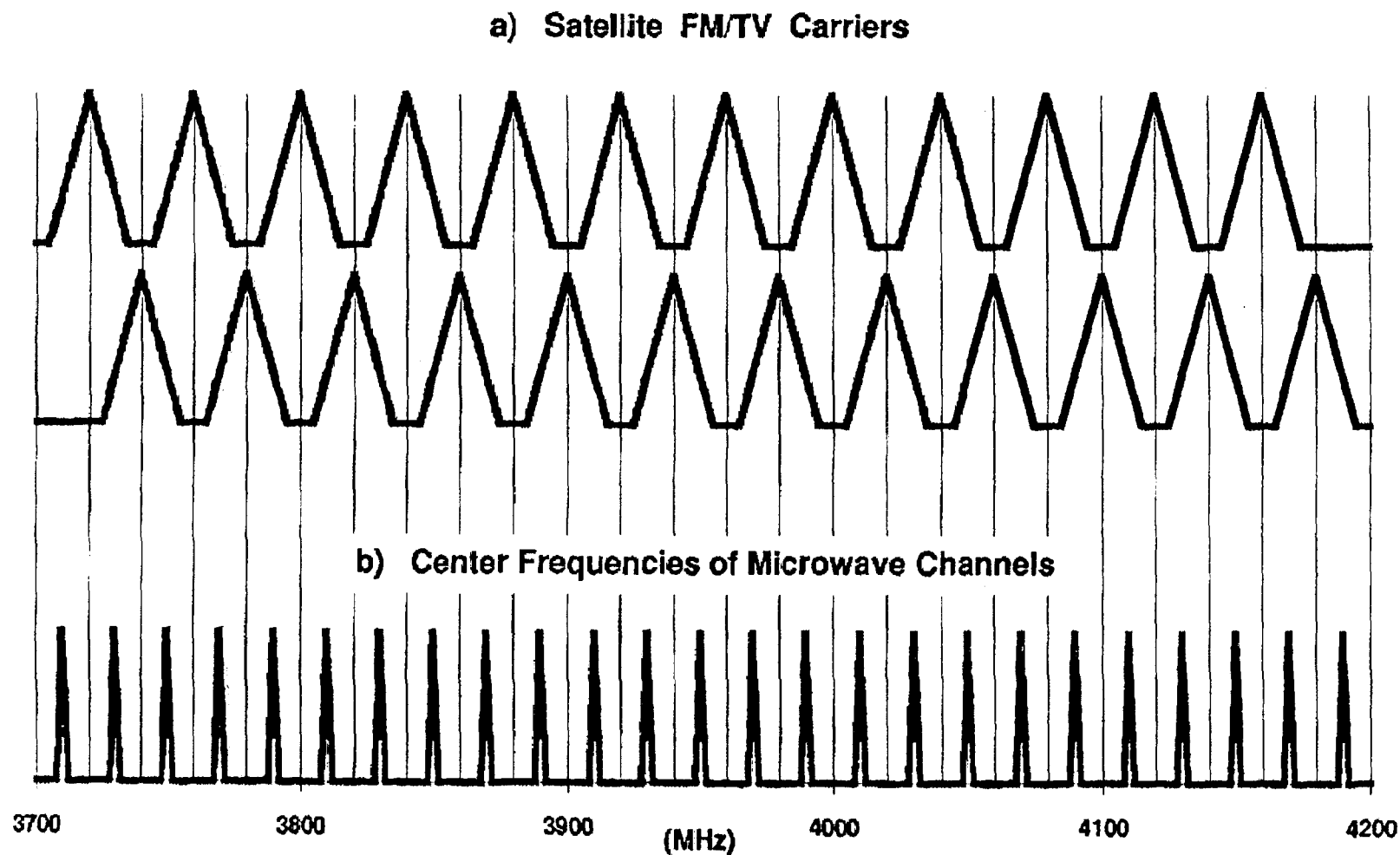
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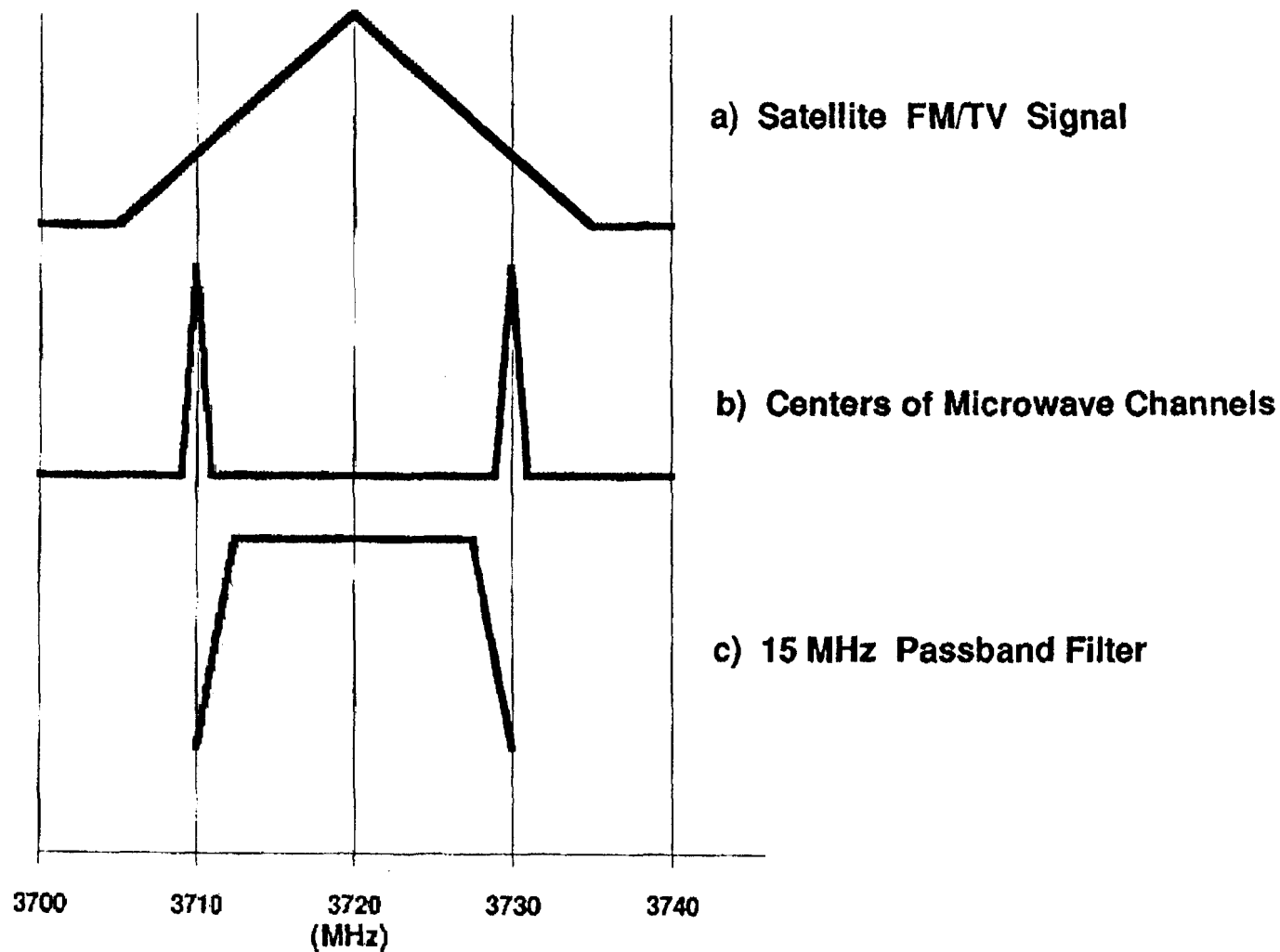
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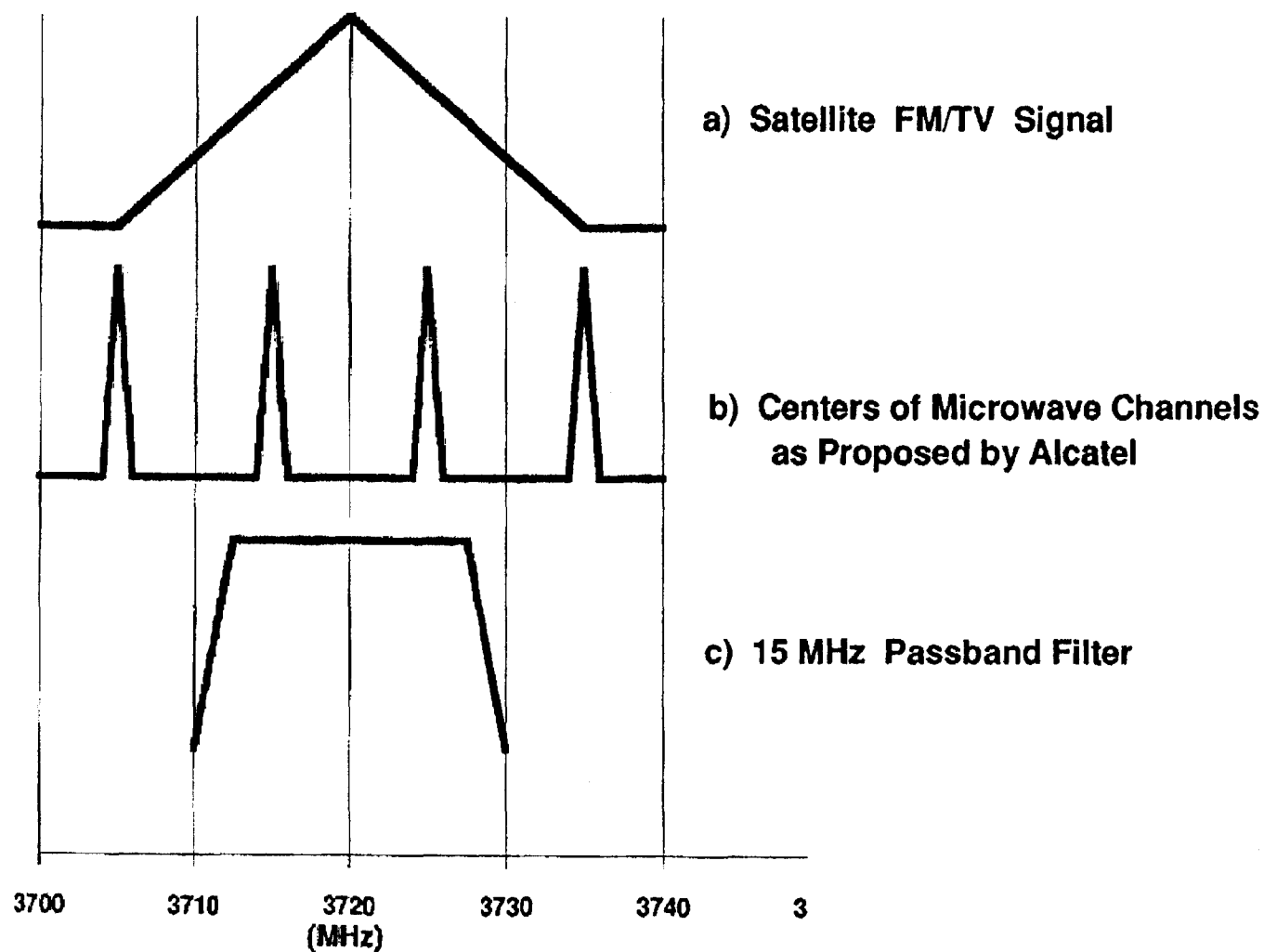
**Exhibit 1. Present Frequency Assignment for Satellite Transponders and Terrestrial Microwave Systems**





**Exhibit 2. Example of a Passband Filtering Approach to Combat Interference Entering Satellite Receive Antennas from Terrestrial Microwave Systems**





**Exhibit 3. Passband Filtering Useless to Combat Proposed  
Rechannelized Microwave Frequency Plan**